JPRS 76300

26 August 1980

West Europe Report

SCIENCE AND TECHNOLOGY

No. 30

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 76300

26 August 1980

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 30

CONTENTS

UTILIZATION OF ENERGY SOURCES STUDIED

Paris SCOOP ENERGIE in French 15 May 80 p 8

[Text] Heat "available" at moderate temperature--either underground (geothermal) or industrial waste (smoke, cooling air or water)--will be recovered increasingly.

Right now (as part of the work of the Leroy Commission), 140 heat supply networks provide 3 percent of the housing units and consume 2.3 Mtep per year, including only 15 percent in the form of "available" heat.

Studies conducted by the division under the direction of Mr Bernard Augustin--whom Industry Minister Andre Giraud has put in charge of promoting this important sector, and chairman of the "Promocal" ad-hoc Association--make it possible to expect, by 1990, the utilization of close to 5 Mtep of "available" heat, including geothermal heat (0.8-1 Mtep), incineration of manure (0.5-0.8 Mtep), industrial thermal waste (0.3-1 Mtep), small nuclear power plants for heating purposes of the "Thermos" type developed at the CEA [French AEC] center at Grenoble (1-2 Mtep). While the energy recovered on the average contributes to the extent of 75 percent of the heating of a particular premise consuming a total of 1.25 tep per year, then the target would be to connect between 2 and 4 million equivalent housing units in this fashion.

In addition to the necessary promotion effort here, which was also entrusted to Mr Augustin, and the case-by-case analysis of the financial and commercial setup, it was necessary to create the proper legal framework which, in contrast to electrical and gas energy transportation and distribution facilities, practically does not exist as yet. Hence, the filing, 2 years ago, of a bill pertaining to energy savings and the use of heat, which has been voted on during a first reading by the National Assembly and which is currently in the Senate:

Declaration, to the administration and the communities, of "available" industrial heat, as well as the conditions involved;

Possibility of paralleling this classification with the creation of priority development parameters within which the connection of new installations could be made obligatory;

Specifications for heat transport, distribution, and storage.

5058
CSO: 3102

FRANCE TO AUGMENT SOLAR BUDGET BY 50 PERCENT

Paris AFP SCIENCES in French 5 Jun 80 pp 27-28

[Text] Paris--Probable 50-percent increase in French solar budget. The budget devoted to solar energy is to be increased by some 50 percent in 1981, compared to this year, as was hinted on 29 May by Mr Henry Durand, Chairman of COMES (Solar Energy Commission), addressing the public hearing organized by the combined parliamentary study group on problems of consumption and the foundation of the quality of life, security, and consumption.

"Although COMES remains a rather modestly-sized organization, it does have a budget which is beginning to become substantial: F 50 million in 1978, F 100 million in 1979, F 150 million in 1980 and perhaps F 230 million in 1981," Mr. Durand said; he also noted that "close to half of the funds of COMES go to research, both public and private" and that furthermore, "the French solar industry, the world's second-ranking one after the United States, is first on export markets."

The sectors which will benefit most from the increases undoubtedly will be housing (solar water heating and room heating) to the extent of about 80 percent and the biomass (use of agricultural waste, wood, etc.) to the extent of 80 percent, followed by the photovoltaic sector (solar cells) with 40 percent.

As a matter of fact, all solar expenditures, both public and private, will by far exceed a figure of half a billion francs.

French industrial firms are increasingly turning to new sources of energy. Apart from research, ELF AQUITAINE invested one billion francs over a period of 5 years for development in this field including photovoltaic cells and detectors in solar geothermal engineering, agricultural energy, systems and alternation, etc.

According to Mr Serge Bielkoff, head of the solar energy industry development mission attached to the industrial directorate for new forms of energy, of that company, this oil company today has equipped its entire

radio-telephone network in Gabon for solar operation, along with several radio-link stations. In Tunisia, the replacement of chemical batteries for supplying radio-link networks along pipelines with photovoltaic solar cells have made it possible to reduce electric energy operating costs by two-thirds.

5058
CSO: 3102

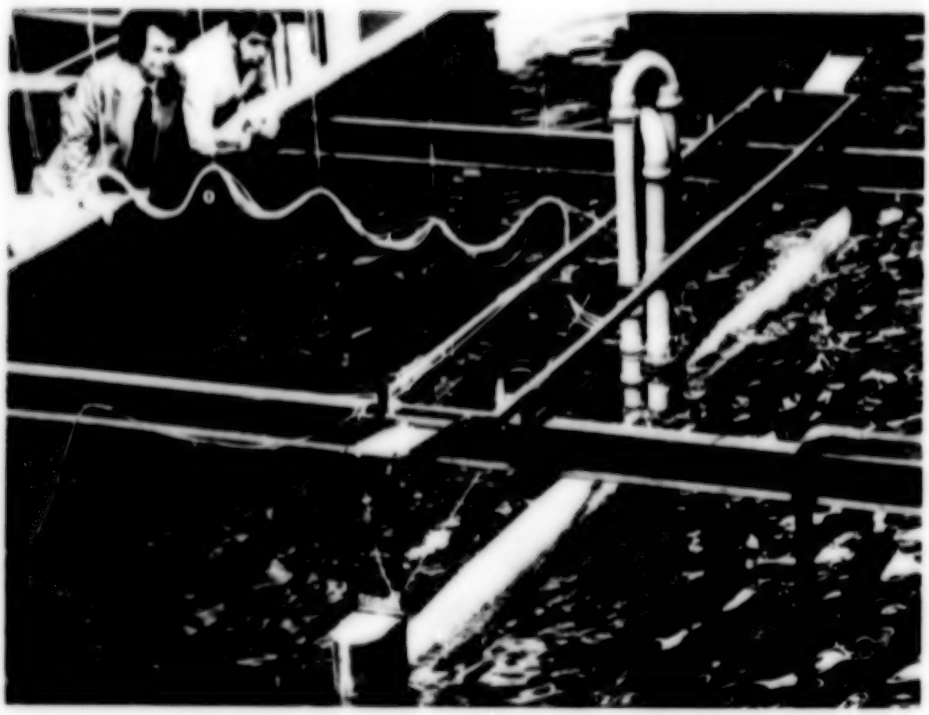
FLEXIBLE-BAG WAVE-ENERGY DEVICE DEVELOPED

Duesseldorf MT MEERESTECHNIK in German Feb 80 p II

[Article: "Electrical Energy From a Flexible Bag"]

[Text] The British wave-energy research program now extends even to an autonomous process for production of electrical current from ocean waves. This is accomplished using a rubber tube, or bag. Tests carried out at the University of Lancaster in Northern England have shown that this could be one of the most economical methods of generating current from wave energy.

The "Lancaster Flexible Bag Device" is presently being tested in a wave tank (Photo) at the University. The operational version would be a 200-meter-long reinforced rubber bag divided into air-filled chambers which would be restrained by a concrete base anchored beneath the surface of the water. The 6.5-meter wide and 14-meter high "bag" would float on the surface of the water with about 80 percent of its volume submerged. The system would be positioned perpendicular to the direction of the waves; and, as the wave crest moved across it, air would be squeezed through the chambers. Thus, the formation of a giant squeeze pump would generate the energy for driving a turbine. The probability of damage by heavy seas is decreased by proper positioning of the "wave generator."



Even though the first studies yielded much higher values than anticipated, additional time will still be spent on making system improvements including increasing the durability of the rubber and developing a method for keeping the bag level under various sea states to achieve maximum efficiency.

9160
CSO: 3102

TOTAL OF 143 MILLION MARKS FOR COAL RESEARCH IN 1980

Frankfurt/Main FRANKFURTER ALLGEMEINE BLICK DURCH DIE WIRTSCHAFT in German 9 Jul 80 p 1

[Article by MV: "Greater Investments Needed for Deep Coal Mining"]

[Text] Essen, 8 July--As the importance of German hard coal as fuel for the supply of power increases so do also expenditures for research and development in the areas of mine safety, mining technology, coal refining and utilization. The Hard Coal Mining Association in Essen, comprising six German coal mining companies, will spend DM 143 million on coal mining research this year. DM 126 million were spent for this purpose in 1979 and DM 121 million in 1978. Of this amount 50 percent alone will be spent on coal refining and coal application projects.

In presenting the latest annual report of the association, Chairman Friedrich Carl Erasmus pointed out that DM 1.6 to 1.7 billion will have to be spent annually on opening new mines in order to secure and further develop mining output. Over the past 10 years the number of pits decreased by about 60 percent to at most 230 but due to increasing mechanization median daily coal output per pit has risen to 1,400 tons of crude coal. At the same time coal seams which could not be mined economically before for technical reasons can now be exploited. According to Erasmus coal mining research currently focuses on problems connected with mining coal at depths exceeding 1,200 meters. In this endeavor the scientists place great reliance on new coal drilling machines which weigh only half as much as the ones now in use (150 instead of 300 tons) and which "cut" the rock with a jet stream exerting a pressure of 4,000 bar. These new machines allegedly increase the rate of advance from the current 20 meters to 35 meters per day.

With the opening up of adjacent coal fields and the sinking of new shafts the transportation problem is gaining increasing importance. Currently deep coal mining uses trains running every hour and 900-km-long conveyor belts to transport coal and people. Researchers of the Hard Coal Mining Association plan to employ in the future automatically controlled large train systems.

Among the association's research goals is also coal conversion. In this area board member Prof Dr Werner Peters expects that direct conversion of coal to heat will make a greater contribution to the supply of heat than coal gasification and liquefaction because in the latter conversion 30 to 45 percent of the caloric content is lost. In his opinion thermal stations employing fuidized bed combustion where sulfur is separated by reaction with limestone, whereby pollution is controlled much better than in existing thermal power plants, can be used advantageously to heat primarily small residential settlements where connection with district heating systems would be uneconomical. In this field the mining association is also engaged in developing automated thermal stations as well as thermal stations whose waste heat can be used for power production.

8664
CSO: 3102

BRIEFS

EXPERIMENTAL WAVE-POWER PLANT--Experts have calculated that the ocean waves which bear down upon the long serrated coast of Norway could produce many times more electrical energy than is presently produced by all of the power plants in the country. In view of this theory, it is understandable that in Norway not only is there a lively interest in this potential but also that an industrial-scale working test installation is already in operation. It was put into operation recently at Elnes in the vicinity of Oslo. The most important objective of the installation is to test the principle of wave focusing wherein the waves are made to converge on a point. It will take 3 to 5 years to reach a conclusion. The wave machine of the test facility produces artificial waves in a 150-meter long basin. Triangular aluminum plates are arrayed directly beneath the surface of the water. These impede and reshape the waves, which are then focused on a point at the other end of the basin. In this process the height and power of the waves is concentrated. In a full-sized wave-power plant the height of the waves reaches 10 to 20 meters. They press with full force into a trough which guides them into an artificial sea lying high above sea level. From there the water is conducted through ordinary pipes to a conventional power plant. In the opinion of the experts, it will probably not be necessary to use wave power before the turn of the century. However, if the technical and economic basis is in hand, a Norwegian wave-power plant could be put into operation as early as the mid 1980's. [Text] [Heidelberg ELEKTRISCHE ENERGIE-TECHNIK in German Nov 79 p 331] 9160

CSO: 3102

ELECTRO-EROSION FINISHING IS PRECISE, COST-EFFECTIVE

Geneva L'INDICATEUR INDUSTRIEL in French Jun 80 pp 3, 5-6

[Article by Leslie Parkes, industrial editor in chief, THE METALLURGIST AND MATERIALS TECHNOLOGIST: "Electro-Erosion Carves Out a Niche in the Area of Machine Tools"--passages enclosed in slantlines published in boldface]

[Text] Whether the final product is a synthetic fiber or the crankshaft of an automobile engine, production of the shaping tool by electro-erosion offers technical and economic advantages. However, as in any process for manufacturing machine tools, precision results as much from the concept and construction of the machine tool as from the machine finishing principle itself.

In machine finishing by electro-erosion, an electric potential brings about localized penetration of a dielectric fluid between a shaped electrode and the part to be machined. The discharge produced removes from the part a tiny bit of metal which is carried away by the flow of the dielectric. Since the shape of the cut assumes exactly the profile of the electrode, and since the distance between electrode and the part to be machined can be adjusted precisely, within a range of 0.01 to 0.762 mm, it follows that holes of a very great precision can be made. Moreover, since the operation does not involve any rotation of the electrode or of the part, the complexity of the forms presents no difficulty.

Because of that, an essential characteristic of electro-erosion finishing is that it can serve to make matrices, or to produce parts not many of which could be obtained by other methods of finishing. Furthermore, this process permits previously hardened metals to be finished. But its most remarkable advantage in production is that the electrodes serving as cutting tools need only be produced /in the relatively simple form of a punch/ or male tool.

Two examples help show the precision possibilities of this method. The first example relates to synthetic thread production, where the quality of the fiber is a function of the cross-sectional shape of the filaments; the

characteristic shape is a "Y" and the diameter is 0.6 mm (Figure 1): on the one hand, the tungsten carbide die-plates used for extrusion of these filaments can be produced with precision by electro-erosion; on the other hand, the very nature of the finishing method excludes any risk of burrs or excessive cutting away of the die-plate.

The second example relates to the manufacture of elements for electronic tubes; it concerns as a general rule two cages cut out of very thin metal cupels and mounted concentrically in the tube. The precision of the finishing process is critical for assuring a precise fit. The fineness of regulation of the process and the precision inherent in the machine itself permit carrying out this operation in mass production.

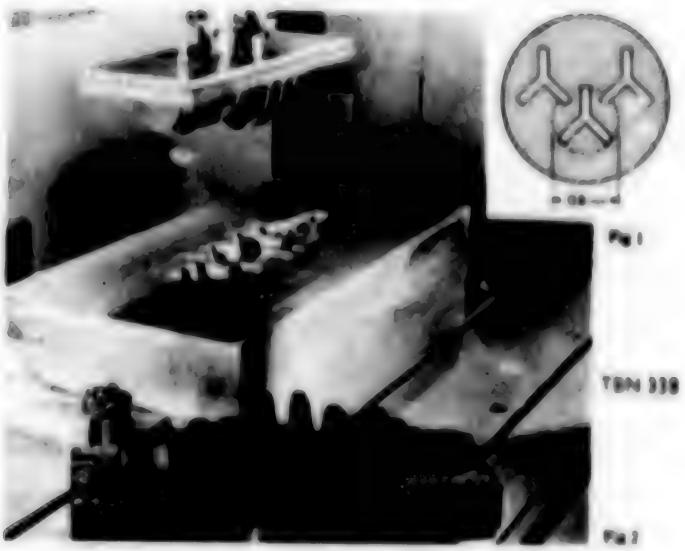
It is hard to find other methods of finishing than electro-erosion to carry out such operations. However, highly specialized applications are involved here, whereas the process has much more ordinary applications where its technical and economic advantages are not yet appreciated at their true value.

Two distinct considerations are paramount in any operation for producing machine tools, namely, the precision absolutely required and the cost-efficiency ratio of the method. Theoretical tolerances which can be reached by electro-erosion have been indicated already. While the rates of removing metal are low in comparison to classical milling (approximately 350 cu mm/min using a 50-amp generator), one must take into account the fact that we are talking about total removal of metal, /whatever the complexity of the work/.

Moreover, there are other economic advantages: on the one hand, the electrodes are made of materials which are easy to work, graphite or copper, and, on the other, since electro-erosion finishing can be done on a previously hardened metal, the risk of deformation after machining is eliminated.

Other production advantages are as follows: stamping machines for an automobile crankshaft and for a spoon are shown in Figures 2 and 3. The matrix of the crankshaft is ready for use when it leaves the erosion machine. When, after prolonged use, the matrix requires refinishing, it is not necessary to re-anneal it; it is sufficient to put it back in the erosion machine, to reinstall the electrode used previously and to refinish in order to restore the stamping profile. The matrix can then serve for a new stamping run.

For the manufacture of spoons, a male copper electrode (Figure 3 in front) serves for scooping out a matrix with which a certain number of copper parts are made before starting actual production. The spoons made of copper can then serve as electrodes to produce other matrices by electro-erosion.



Electrofinishing Machines

By its very principle the process of electro-erosion is self-regulating: provided that finishing conditions are well regulated and maintained, erosion will continue without outside interruption until a cavity is formed which corresponds exactly to the form of the electrode. When the removal of metal reaches the value set at the start, the process stops. The electrofinishing machines offer another important advantage over classical milling machines, in that the tool is not subject to stress and does not come in contact with the part during machining.

Here, however, any difference between electrofinishing machines and classic machine tools ceases. A finishing method is only good to the extent that the means of putting it to work are there, and the close tolerances permitted by electro-erosion demand a high-quality machine to guarantee

attaining them. Indispensable characteristics are rigidity, precision of control of the coordinates, stable and controllable power, and complete removal of the products of erosion by circulation and filtration of the dielectric fluid. The other requirements follow logically from this: the machine tool workships must be equipped with functional machine tools of ergonomic design, including a minimum of controls to activate, so as to assure reliable and precise results. The eight different machines of the "Eurospark" series by Agemaspark were designed with these criteria constantly in mind.

Two models which recently came to complete the series, namely, the Eurospark 650 and the Eurospark 740, are typical of this series while possessing specific characteristics which determine their uses in the machine tool workshop. Their chief characteristic is a servo-operator with great sensitivity in the finishing head, based on a high torque direct current motor, assuring an infinite resolution of control signals, with very low inertia. The movement is transmitted by tempered guide screws corrected by taking up the play, assuring a rapid and precise displacement of the electrode, while a total security lock prevents any accidental overfinishing. A sound and sight "touch" indicator furnishes a reference point for micrometric adjustment of the finishing depth. Tempered dovetail slides or rectified "V" grooves, with needle bearings, increase the inherent rigidity of the frame, and allow a constant relation to be maintained between the movement of the finishing head and the work-plate.

Model 650

The 650 (Figure 4), smallest of the Agemaspark series, is a completely autonomous machine, including the finishing head and bench, generator and dielectric circuit, joined together in an assembly covering 1 x 1.2 m of floor area. Despite its small dimensions, the 650 can work on parts of 405 x 250 x 210 mm in size. Other than manual regulation of coordinates, all functions of the machine are operated by pushbuttons from a central panelboard. The current can be set from 0 to 25 amp in increments of 0.5 amp; to increase the working speed, the feed can be supplied at high tension for the first 10 amperes. The rate of material removal varies from 300 to 22 cu mm/min, with values for surface roughness of 1.2 and 0.6 m Ra, respectively. [Ra = root mean square average.]

Fig 3

Fig 4

TBN 338 Fig 5

Model 740

An interesting characteristic of the 740 (Figure 5, left) is in the variable height finishing vat, including automatic regulation of the dielectric level. This vat can be regulated at any position between the highest level and the lowest level, in order to give any depth of dielectric wanted, up to 250 mm maximum. Because of this, in addition to progressive regulation of the dielectric depth as a function of the thickness of the parts to be finished, the vat and the dielectric level can at any moment in the course of finishing be lowered so as to be able to inspect the part. The total duration of the displacement of the vat from one extreme position to the other comes to 20 seconds.

The modular 50 amp impulse generator (Figure 5, right) may have one 50 amp outlet or two 25 amp outlets. By selecting a servo-generator one can obtain four 25 amp outlets, to feed four different electrodes.

Role of the Dielectric

Performance of an electro-erosion machine is greatly dependent on the control and treatment of the dielectric fluid, the characteristics of which vary continually as a function of the temperature and of contamination by the products of erosion. Both Model 650 and model 740 are equipped with efficienct systems of filtration and cooling; but these two machines have another characteristic. The complex cavities of a part can sometimes retain particles, which causes output to plummet and finishing time to increase; the Agemaspark machines are provided with standard cleaning equipment which commands a periodic raising of the electrode while a jet of dielectric sweeps the cavity and entrains the particles. The output is controlled by a device which measures the impedance of the air-gap. One thus realizes that while electro-erosion has made possible certain finishing operations which were difficult or impossible to achieve up to now, the improvements introduced recently in the design of machines and circuits have put electro-erosion into the category of industrial finishing operations. Many economic factors play a part here. Machine tools are rarely capable of competing with electro-erosion for a category of hard and tough materials, notably tungsten carbides. And from the viewpoint of the user, none is as silent, as sure or as clean for the environment.

5586
CSO: 3102

AIGRAIN ADDRESSES PARLIAMENT ON RESEARCH STRATEGY

Paris AFP SCIENCES in French 5 Jun 80 pp 1-3

[Text] Paris--Research: General Debate on Research Policy in Parliament. The 29 May session of parliament was devoted to a statement by Mr Pierre Aigrain, secretary of state for research, followed by a general orientation debate on French research prior to an examination of the research budget and the plan, during the coming autumn session.

As the minister recalled, this debate had been requested by all parliamentary groups during the last budget discussion.

Mr Pierre Aigrain then did not spell out the sector research options but rather the broad principles, such as national upgrading of results, decompartmentalization in all fields, balance between long-range and medium-range as well as short-term application projects.

According to the minister, a certain number of actions, taken over the past several years, were aimed at the "preparation of this big future for research"; these actions included reforms in certain research organizations, amendments in research personnel regulations, preparation of the research "organizational chart," although further, detailed decisions remained yet to be made.

The research effort must grow quickly and within a large proportion and precise figures will be presented during the next budget session. This growth must be increasingly balanced between the public effort and the effort made by the enterprises. Confusion among major technological programs and a strengthened "research envelope" should be eliminated in order better to distinguish among the parts of a public research budget for the first time submitted to parliament in its totality, the minister pointed out.

More long-range programing was also outlined by the minister, such as the "Teillac Report" on the materialization of major equipment undertakings for research during the decade, the development of formulas permitting cooperation between disciplines on nine major programs:

Microelectronics outside the traditional fields of telecommunications and information science;

Meteorology and climatology, processing by means of satellites and computers;

Production of fluid fuels on the basis of different petroleum sources;

Mechanics and materials;

Human nutrition and food;

Biomedical technology and logistics;

Medications and pharmacology;

Biotechnology and microbiology;

Relations between technology and jobs.

In addition to the recommendations designed to persuade the enterprises to increase their share of the national research effort are under study and the conclusions of ten scientific reports from certain research agencies will be published.

All of these actions together constitute what government authorities have called the "ten-year research program" and parliament could express its opinion as of the autumn session on the five-year planning law which the minister has referred to as "the immediately planned portion of this strategy."

Finally, these major guidelines will have to be explained to the public at large; this is the purpose of the "White Book" currently being prepared, the minister concluded.

Following the statements by the minister, nine speakers presented their criticisms in parliament; in particular, there were two speakers who made this an outstanding session; they were Messrs Alain Devaquet (RPR [Rally for the Republic]) and Jean-Pierre Chevenement.

Remarks by Mr Alain Devaquet

Mr Devaquet first of all indicated that, as far as the future is concerned, the diagnosis was simple but the treatment was extraordinarily complicated because we find at this time a multiplication of the number and nature of variables involved. Thus--the deputy continued--the causality is not longer linear and each country at this time represents an entirely open system.

Therefore, concerning scientific research, we can understand this world only if basic research activities are of exceptional quality, as the only arm of our technological efficiency, Mr Devaquet emphasized. In this connection he recommended that the following three rules be followed:

In research, as in the economy, one does not always get what one would like to get; one must therefore learn how to get the most out of the unexpected, even if it is contrary to what we anticipate;

Decisions often have the opposite effect, along with directly evident consequences;

Accidents and crises often have more impact than continuity; it is therefore necessary to take crises as events from which one can learn lessons.

These three rules constitute what the RPR deputy called an "attitude of modesty" in the light of which all basic research conducted over the past 30 years gave us powerful concepts of practical analysis which one must use; thus, in the image of thermodynamics, the more complex a system is, the less fluctuation can it entail in connection with the initial equilibrium; second, the only antidote to this imbalance is the quality and speed of information between the various parts of that system; finally, within these changes, a centralized agency is "uneconomical."

After having talked about research and understanding, the deputy spelled out a certain number of action methods: In this connection, matter, energy, and information must constitute the essential priority;

Matter, for development, for example, of substitute synthetic products or research on metals;

Energy, for new ways of managing it, through the slow development of a consumption model compatible with our resources;

Information, microlasers with optical fibers, going through the entire information cycle in order to achieve independence in these fields.

But these promises will come true only in the kind of propitious climate which, according to Mr Devaquet, will not make it possible popularize but rather to "humanize" science in order to achieve a real "intellectual conversion" with respect to science, something which is possible if:

The law provides broad access to official documents,

"French discretion" is eliminated in connection with a real debate on the major themes (genetic, nuclear engineering, etc.),

The government understands that one does not change researchers by decree.

Remarks by Mr Jean-Pierre Chevenement (PS [Socialist Party])

The deputy first of all expressed regret over the fact that the government consults parliament when it is too late, that is to say, when the essential measures have already been taken (reform decree, amendments in charters, etc.). Regarding the major programs, Mr Chevenement was astonished at the lack of infrastructure and the abandonment of certain sectors, in this connection, the statistics speak loudly, according to the deputies: In 1980, allocations for the "research envelope" were increased 12 percent, considering inflation; they however declined 3 percent in terms of constant francs. According to the PS, it is therefore necessary to increase research funding to 2.5 percent of the GNP instead of the 1.8-percent figure today.

5058
CSO: 3102

EXPERTS OUTLINE TEN-YEAR RESEARCH PLAN

Paris INDUSTRIES & TECHNIQUES in French 20 Jun 80 pp 8-9

[Text] A group of experts assembled by DGRST (General Delegation for Scientific and Technical Research) has just spelled out the major outlines of the ten-year research plan in France. The report deriving from these activities lists the strong points and the weak points of French basic and applied research and recommends a certain number of steps. This document will be submitted to the administration which will make the final decision on the options to be selected.

The field of materials is considered a priority field by the group of experts under the chairmanship of Professor J. Friedel: "Survival and the development of industrial activities will call for a policy stressing top-of-the-line products, rather than the big battalions of current production and a general and very intensive research effort."

Four research directions are recommended from this viewpoint: The optimization of performance-cost-method, gain in weights, durability, quality, and control. A special place must be assigned to treatment and shaping processes and to the perfection of new corrosion-resistant and high-temperature resistant materials.

While the basic equipment of private and public laboratories is considered to be good, many problems still remain to be solved. "The concept of the science of materials is rather poorly developed in France and there are three types of weaknesses here: Insufficient knowledge transfer, lack of final and complete research, and an unsuitable teaching effort on materials in engineering schools."

The mechanics sector likewise reveals certain weakness: "The inadequacy of work in mechanics is particularly striking in the field of machines, mechanisms, and robots. In economic terms, this produces a big threat coming particularly from Germany and Japan."

Major efforts must be devoted to surface problems (friction and wear) and automation systems, where French applied research looks inadequate: "There

is almost no interest in kinetics and in the science of mechanisms; this is a gap which entails the risk of becoming very serious in dealing with all problems of automation and robot engineering in general."

"Biotechnology" is another priority program. The study group chaired by Professor Durand feels that "The most urgent action is very far up along the line, in the development of basic research, the organization of result transfer toward industrial applications, as well as personnel training." After having analyzed, "without complacency," the factors limiting the improvement of the overall level of basic research (insufficient funding, thin trickle of money, lack of flexibility, etc.), the study group recommended general support for biological research and specific support in the fields of genetic engineering, the genetics and physiology of prokaryote cells, of eukaryote cells, and of biological reaction engineering.

It is also necessary urgently to take into consideration the problem of linking basic research with industry. The report thus stresses the importance of transfer centers. Several initiatives have already been launched, such as "genetic engineering group" (G3), consisting of the Pasteur Institute, the CNRS [National Center for Scientic Research], the INSERM [National Institute of Health and Medical Research], and the INRA [French National Institute of Agronomic Research]; the "Center for the Production of Biomolecules," created by the Technological University of Compiegne and the Institute of Active Surfaces; the Scientific Group of Toulouse, including the CNRS, the INSA [National Institute of Applied Sciences], the INRA and the Paul-Sabatier University; the "Genetics and Microbial Biotechnology Center" with the National Agronomic Institute at Paris/Grignon and the INRA (Dijon).

To step up the efforts of these transfer centers, it seems essential to promote the establishment of predevelopment centers. It has been proposed furthermore to the DGRST that it launch a concerted effort this year on the topic of constructing new strains of microorganisms which are of interest to industry. This effort implies the creation of an information data bank.

In the third part of its report, the study group identified a certain number of integrated research operations linking the public research and industrial research sectors in order to attain a specific social-economic goal which is a part of the main thrust of national policy in the matter of energy, environment, agriculture, health, food, and the chemical industry. Some of these operations are feasible in short-range terms, such as the fixation of nitrogen, the production of ethanol from plants that produce starch and saccharose, production of methane, etc.

In the last part, the group takes up the problem of education and instruction, noting that "The weakness of French biotechnology is more on the

'bio' side rather than on the 'technology' side. This is why it is indispensable to review the theoretical and practical education being given to engineers and researchers." The report's authors furthermore think that it is important "to support and develop the existing centers, rather than create new ones."

5058
CSO: 3102

FRANCE-VENEZUELA COOPERATION IN ENERGY OUTLINED

Paris L'INDUSTRIE DU PETROLE GAZ-CHIMIE in French May 80 p 11

[Text] The conversations that were held during the stay of the president of Venezuela, Mr Luis Herrera Campins in Paris in April naturally revolved around petroleum. This meeting came several weeks after the cooperation agreement between INTEVEP [Venezuelan Institute of Petroleum Technology] and the IFP [French Petroleum Institute] (see L'INDUSTRIE DU PETROLE, April 1980, p 12) and there is every reason to believe that relations between these two countries will be strengthened.

In the petroleum area, the idea is to raise Venezuelan crude imports into France from 1.74 million tons in 1979 to 2.24 million tons next year.

CFP [French Petroleum Company] and PETROVEN [Venezuelan Petroleum, Inc] will combine their efforts toward the intensive exploitation of hydrocarbon deposits around Lake Maracaibo and in the region of Maturin.

ELF is also negotiating a supply contract involving about 45,000 barrels per day of heavy crude coming from Lake Maracaibo. This project will probably require the expansion of the Donges refinery, in spite of the high installation costs.

Plans also call for Caracas and Paris to get together on the construction of refineries on the Paraguana peninsula and the modernization of the El Palito and Cardon refineries.

France will furthermore participate in the development of several priority sectors under the Sixth Venezuelan Five-Year Plan (1981-1986), including the energy sectors as well alternate energy sources, petrochemistry, the port infrastructure, and oceanography.

In our June issue we will in greater detail cover the countries of Latin America and especially Venezuela in their dealings with CdF Chemistry.

9058
CSO: 3102

FRANCE-JAPAN TECHNICAL COOPERATION PROPOSED

Paris AFP SCIENCES in French 19 Jun 80 p 4

[Text] Tokyo--Leading Industry: French Proposal to Japan for a Joint Research Program, According to KEIZAI SHIMBUN. The French government has proposed a joint research program to Japan on the development of new energy sources and industrial technologies, NIHON KEIZAI SHIMBUN reported on 17 June.

Citing sources close to the Ministry of International Trade and Industry, the Japanese daily indicated that this proposal was submitted by Mr Jean-Pierre Souviron, director-general in the Ministry of Industry, who met his Japanese counterpart on 16 June.

According to KAIZAI SHIMBUN, the various sectors involved are:

Industrial robots,

Electronic computers and components,

Aviation,

Energy conservation techniques,

Solar energy, liquefied coal and geothermal energy,

Mining resources and ocean exploitation,

Bioenergy.

This program furthermore calls for the creation of a French-Japanese consortium to help these industries get export orders.

5058
CSO: 3102

SMALL-TO-MEDIUM INDUSTRY TO RECEIVE AID IN MICROELECTRONICS

Paris INDUSTRIES & TECHNIQUES in French 10 Jun 80 pp 82, 84-88

[Text] In view of the irresistible invasion of microelectronics, the Ministry of Industry has launched an effort designed to maintain the competitive capability of French industries; the idea is to provide for dynamic impetus aimed at downscaling the use of micro processors and integrated circuits in general. This effort is expressed by the financing of a campaign urging the use of microelectronics in manufacturing processes and in the products themselves, as well as support for enterprises within the context of public assistance for innovation.

The government effort in support of the use of microelectronics, called "Microelectronics and PMI [Small and Medium Industry]," was announced in June 1979 by Industry Minister Andre Giraud and Secretary of State for Small and Medium Industry Jean-Pierre Prouteau. This operation is taking place, in Ile-de-France, during this first half of 1980.

Indoctrination and Incentives

The incentive aspect of the "Microelectronics and PMI" campaign involves three aspects: Indoctrination, training, and assistance as well as consultation. The organizers, who have been put in charge of the effort to promote this incentive drive, were selected by a board made up of representatives from the ministries concerned as well as the components manufacturers.

Concerning the prior indoctrination effort, contracts were awarded to companies charged with conducting information conferences and establishing a preliminary diagnosis for the PMI which attended one of those conferences. The purpose of these conferences is to bring out the technological and economic advantages deriving from the use of microelectronics through demonstrations of applications already implemented as well as reports and

debates involving the participation of PMI which have already "gone this route." These conferences are being held in Paris and in the suburbs at the rate of about eight per month.

The second aspect has to do with "training" and is being taken care of by agencies such as CEPI, ESEI, ISAI and other institutions of higher education. The teaching effort has been guaranteed--up to 50 percent--by the Ministry of Industry, which also shares in the training course operating costs, as well as through subsidies reducing the cost per trainee-hour to a figure of F 25. The instruction given to management personnel and technicians is designed to give them not only a mastery of relations with possible subcontractors (short-term course) but also complete technical competence (long-term course).

The next chronological stage involves assistance and consultation; it consists in the establishment of contact with specialized organizations having the necessary technical capacity to handle--if necessary,on a subcontract basis--the effective development of new products. These organizations will in this connection get the benefit of investment aid (see the names of these various organizations at the end of the article).

Aid to Innovation

Public assistance for innovation concerns products and manufacturing processes whose innovative character has been evidenced. Enterprises which will introduce microelectronics into their products or into their production processes can obtain such aid. This aid will come in three ways: Bonus for innovation, assistance for innovation, and medium-term innovation loan.

The innovation bonus consists of a subsidy equal to 25 percent of the amount of money turned over to public or private research organziations selected or to selected scientific and technical experts, within the limit of F 1 million, per enterprise and per year. The beneficiary enterprise must have a personnel force of less than 2,000 and the majority of its capital must not be held by one or more companies whose shares are quoted on the stock exchange. Aid to innovation replaces the old aid for preliminary development and development and takes the form of either a subsidy or a repayable advance, up to as much as 50 percent of the total cost of the innovation program (filing and extension of patents, market surveys, design, implementaion, perfection, prototypes, pilot facilities, etc.).

These two types of aid must be requested from ANVAR. The medium-term innovation loan is a medium-term bank loan, backed up by INODEV; it may involve delayed repayment. The INODEV is a specialized security guaranty insurance company, created for this purpose under the sponsorship of the CNME (National Fund of Government Orders). The medium-term loan can cover up to 70 percent of the TTC [all taxes included] expenses of the innovation program, that is to say, the expenditures involved in the industrial

and commercial launching of the innovation, the research and development expenditures connected with the perfection of the invention, as well as the investment expenditures (excluding land or heavy construction work). Applications for this kind of medium-term loan must be addressed to the INODEV. It must finally be pointed out that aid of a nature other than the kind we have just outlined is given to PMI by the government although this aid does not strictly belong within the framework of the needs of enterprises desiring to innovate by using microelectronics.

Microelectronics--Why? To Do What?

Although the public is familiar with microelectronics only from the most visible applications (quartz watches, pocket calculators, electronic scales, automobile "dashboard computer," etc.), this technique is currently already present in numerous elements of our daily life (electric household applicance programmers, protection and regulation devices, telephone devices). It is included in production equipment and industrial detectors, in all information industry equipment and everything connected with information, in office machines, in most medical equipment, etc. This "revolution" is in the process of changing not only the general economy of our industry--through its (theoretically positive) action on cost ratio, the duration of repayment, and the nature of certain investments--as well as the organization of enterprises.

The main reasons that persuaded the government to launch this campaign uring the systematic utilization of microelectronics are to be found above all in the enormous rate of expansion of this technique (for the past 18 years, the total output of integrated circuits has doubled about every 18 months and it is probable that this rate will continue over the next several years), and, then, the lowering of related production costs.

Speed of operation, energy savings, performances, reliability, and relative low cost--these are the arguments advanced in favor of the systematic employment of integrated circuits in everything concerning data acquisition, controls, automation and regulation, telecommunications, data posting, and printing, information processing, and more generally the replacement of controls transmitted through physical action.

Since microelectronics at any rate in medium-range terms is bound to touch on entire industry sectors, the question is no longer "Is microelectronics a good idea?" but rather "How are we going to introduce it?"--otherwise we will be denying ourselves a means for safeguarding or winning the kind of competitive capacity which is indispensable to growth in France and to increased export. This is perhaps one way of being forearmed against the threats of unemployment inherent in any upset in the laws of the market.

"Microelectronics and PMI Outside the Paris Region"

An effort similar to the one in Ile-de-France is being made in the rest of France of course. This operation will go on until the end of 1980. Its methods are the same as for Ile-de-France, that is to say, incentives, indoctrination, and aid for innovation. The organizations to be contacted--for assistance to design (innovation) and development--are the "interdepartmental service of industry and mines" in the region concerned.

ANVAR(National Agency for the Improvement of Research), 13 rue Madeleine Michelis, 92522 Neuilly-sur-Seine.
INODEV: 14 rue de Gramont, 75002 Paris.
DIELI (Directorate of Electronic and Information Industries), 120 rue du Cherche-Midi, 75006 Paris, phone: 567.52.34.
DII (Interdepartmental Directorate of Industry), 152 rue de Picpus, 75012 Paris, phone: 344.33.30.

5058
CSO: 3102

TRANSPORTATION

FRENCH TRAIN FASTEST IN WORLD

Duesseldorf WIRTSCHAFTSWOCHE in German 4 Jul 80 pp 22-23

> [Text] The French state railroad is currently testing the fastest train in the world in the Alsatian Rhine valley. The railroad--once almost pronounced dead--is turning into a new export success among French manufacturers.

Except for the monotonous humming of the air-conditioning no sound can be heard. The world's fastest train glides out of Strassbourg's main station as if on cotton wool. Only when the orange-grey electric locomotive has passed the last switches in the direction of Colmar does the acceleration push the passengers gently back into the high backs of their seats in the eight uncompartmentalized carriages.

For 12 kilometers the French TGV (train a grande vitesse) steadily picks up speed until it has reached its cruising speed: 260 km/hour. At that speed France's newest technical railroad product is traveling 50 km/hour faster than the legendary "Shinkanse"--the express trains on the Japanese Tokaido line.

Inside the locomotive car there is very little sensation of speed. But the TGV is hurtling along the die-straight test track between Strassbourg and Colmar with the speed of a jet taking off. The comparison with an airplane comes up again and again with this train, which has been developed in years of research. Like a jet, the seating space is expensive and confined in the world's fastest train.

Fewer passengers are carried altogether than, for example, in a Boeing Jumbo with charter seating, 111 passengers in first-class, 275 in second. The 380-ton, 17,000-hp locomotive will not get up to full speed until next year. Then the first of a total of 87 TGV trains on order from the French locomotive plant at Alstholm at a total cost of F2.4 billion will begin service in the fall on the line between the economic centers Paris and Lyons.

Because the old Paris-Lyons line is already completely overloaded today, and the high speeds of the TGV are impossible on conventional tracks anyway, the French government decided in 1971 to construct a completely new track. Construction work on the new southeast line began in 1976, and the first section will be opened next year.

The project--the first new above-ground section of the SNCF since 1930--which was made possible with an investment of F3.5 billion (and enormous state subsidies), runs for 425 km through the sparsely settled French southwest. With the TGV project, which will halve the traveling time on the high-speed stretch between Paris and Lyons from the current 4 to 2 hours, the French railroaders remain true to their traditional ambition of being trailblazers on the tracks.

With all the intoxication of speed France's railroad men remain sober enough not to lose sight of the economic aspect of their trains. It was the SNCF after all that was one of the few railroad companies in the world to show a profit--even though a modest one--of F108 million instead of a deficit last year.

Sharp tongues claim that this can be attributed to the fact that the French national railroad--contrary to its name--is not a real national railroad. The state owns only 51 percent. The remaining 49 percent of SNCF capital, in accordance with the treaty of 1937, are held by the former French private railroads, which continue to exist as finance companies and the majority of which are in turn controlled by the Rothschild group. The French state cannot compensate and kick out its private companies in the SNCF until 1982. In any case the SNCF--far more than other railroad companies--follows private business maxims and leaves no marketing trick untried to fill its trains: innumerable cheap fares, happenings in the railroad stations, barber shops in the express trains and, in the night express Azur 2000 from Paris to the Cote d'Azur, even a movie theater and a rolling discotheque. The high-speed train on our French neighbors' state railroad is intended to turn a profit, even though only a modest express surcharge will be added to the fare. The SNCF plans initially to transport 17 to 20 million passengers annually between Paris and Lyons with 60 TGV connections and to amortize the investment costs for the project in less than 10 years. The internal airline company Air Inter, in which the railroad holds 25 percent of the capital, is already worried that it will lose one-third to one-half of its passengers on the heavily traveled connection between Paris and Lyons to the TGV. SNCF bosses argue that this would be economically welcome. In contrast to the kerosene guzzling jets, which increase France's foreign trade deficit with every flight, the trains will run on French current. The SNCF draws it mostly from its own hydroelectric plants in the Massif Central and the Pyrenees.

SNCF President Jacques Pellissier calculates that a massive switch by airline passengers and drivers to the TGV could bring an annual saving in energy of at least 130,000 tons of oil to the French economy. According to Pellissier: "Even today the SNCF uses only 5 percent of France's

transportation energy requirements, although it carries 15 percent of the passenger traffic and 80 percent of the freight."

The French railroad manufacturers are hoping for economic gains from the TGV as well. France has always exported railroad knowhow and material to all parts of the world, such as the complete subway systems for Mexico City and Montreal and also diesel locomotives to black Africa and turboliners to Canada. Last summer the French manufacturers in the industry had orders for F8 billion on their books.

Impressed by the technology of the high-speed train Brazilians and Americans are already negotiating with the French railroad manufacturers. The American Amtrak company alone wants to spend $800 million on rolling stock to renovate its pool. So there is a great deal of evidence that the railroad--almost pronounced dead a few decades ago--will become France's new export success thanks to increasing energy costs and French inventiveness.

9581
CSO: 3102

PROJECT 'RESEARCH PASSENGER CAR' REVIEWED

Duesseldorf WIRTSCHAFTSWOCHE in German 27 Jun 80 pp 86-95

[Article: "Saving Is Expensive"]

> [Text] With support from the budget of the minister for research, industry and science are working on an energy-saving car of the future. The results are promising, but no one knows if the buyers are willing to pay for them.

"Saving energy is not a one-time tour de force but a permanent task," is the announcement being made by Federal Research Minister Volker Hauff across the length and breadth of the land. With one eye on the German automobile industry and their customers he is beset by substantial worries "The impetus to think that came from the first oil price crisis in 1973 has been quickly forgotten, too quickly in my opinion, in the face of surprisingly rapid economic recover and sustained growth of the industry." The minister is letting the effect of rising oil prices bring this home to drivers.

He is challenging the industry not only to develop and build more economical cars but also make clear to the buyer that it is sensible, "to pay more for greater safety, lower energy consumption, less noise and a reduced consumption of raw materials." Sensing diaster Hauff warns: anyone missing the move to the fuel saving automobile will lose his national and international markets tomorrow. Stopgap measures kept in the drawer for future eventualities "no longer suffice," in his opinion, "in view of worldwide competition from alert and involved competitors."

Concerned that the automobile manufacturers would raise considerable sums for the next generation of cars and the one after that but would make far fewer efforts for the long-term assurance of the future, his ministry has started the project "experimental passenger car."

His challenge to the industry to look ahead and to attack the threat of a shortage of energy and raw materials, an increasing strain on the environment and inadequate traffic safety is meeting with a varied response.

Dr Gerhard Prinz, chairman of the board of Daimler-Benz, stressed that progress in economical consumption would have "full approval." He warns against expecting the auto industry to completely renew its entire production program, including all its engines, in one short cycle of a few years. This would necessarily strain the financial and profit capabilities of the companies beyond the limits of survival--with all its effects on employment in this sector of industry. In addition, burdening the companies in this way would soon affect car buyers in the form of drastically rising purchase prices.

Prinz is thinking of current American examples when he asks the question about the financing and the profit-related acceptability of the required investment efforts. After all, U.S. manufacturers "not least because of directive intervention" had been forced into an incomparably greater effort than the European manufacturers who, with their more modern engines, were in a better position to begin with.

By 1985 the remaining American manufacturers have to reduce the average consumption of their fleets from today's 11.75 to 8.55 liters/100 km.

Car of the future from VW: lightweight middle-range car

Otherwise Draconian punishments are in store. The Detroit auto industry estimates the investment necessary for this reduction in consumption at about $80 billion for the period from 1979 to 1985. During this time the largest figure has to be achieved by intermediate stages. The U.S. Government thinks this figure is too high and points out above all that the $80 billion include not only the costs of achieving fuel consumption standards but also for the new safety and environmental regulations.

A study by the U.S. consulting firm Harbridge House in 1979, sponsored by GM, comes to a devastating conclusion:

--lasting effects on energy saving cannot be expected from currently known engine technology

--only limited reserves for saving are available in power units, weight reduction and styling

--the real capital requirements for moves to adapt are 10 times higher than estimates by the government and industry
--capital investments for new technologies require moves to concentrate because these sums are far in excess of all known figures and can be raised by only a few firms
--the net effect on improving methods is questionable, since the costs of the development of advanced combustion engines, which cannot be xpected on the market for 10 years, rise progressively.

European engineers are not quite so pessimistic. They can fall back on existing technology in the development of fuel saving cars. But even so it takes 2 to 3 years until they are ready for the market.

Chief of development at Audi NSU Auto Union, Ferdinand Piech, enumerates what he could offer to the customer who is willing to save: in any Audi with a 4-cycle engine a fuel saving of about 10 percent could be achieved by adding a 5-speed gearbox, a DM 500 extra.

Another 5 percent could be saved with the help of electronic ignition control, which costs at least DM 300 and allows better utilization of the engine's reserves. With an exhaust turbocharger and a correspondingly "tame" axle ratio for DM 1,000, the engine's performance could be increased to achieve another 20-percent saving. An intercooler for DM 300 would fetch an additional 3 to 5 percent, and yet another 5 percent from a fuel-injection system for DM 1,000 instead of a carburetor. The assumption again is a "long" axle ratio, which converts the improved performance of the motor into fuel economy instead of into performance and acceleration. A Diesel engine could achieve even better savings.

A shift to aluminum for bodywork would be very costly, but would also save fuel. The fuel consumption reduction of up to 15 percent would be paid for with a price increase of about DM 2,000. "Who would be willing to pay such prices for this saving in fuel?" asks Piech doubtfully; he sees the greatest potential for saving gas in driving habits: "A 20-percent reduction is possible immediately and without cost."

Dr. Wolfgana Lincke, head of car development at Volkswagen, outlines the basis for new passenger car concepts as follows: if the average energy requirement of a passenger car is calculated "weight is responsible for 47 percent and wind resistance for 53 percent. Even in the urban cycle, which makes up the DIN German Industrial Standards norm, wind resistance still accounts for 13.5 percent, although the average speed is only 26.4 km/hour."

According to Lincke's tests, a 2-percent improvement in wind resistance results in a fuel saving of 1 percent. One percent improvement in wind results in a fuel saving of 0.4 percent. For Lincke this means that radical bodywork changes in favor of lower wind resistance can certainly be expected in the cars of the future and to a lesser degree weight reduction,

especially since lower wind resistance can be achieved "with considerably more cost-effectiveness" than all other measures.

Car of the future from Daimler-Benz: turbine sedan

The simplest way to save substantial amounts of fuel would be not only the simultaneous and balanced change of wind resistance and weight, but also lowered engine performance. According to Lincke, this path is "barred" to the constructor "for cost reasons." He assumes that the increased price for measures to reduce fuel consumption should be amortized in the first 2 years after purchase of the automobile. With gas prices at DM 1.20 there would be a latitude of between DM 280 and DM 310 with an annual driving distance of 15,000 km. That left no room for revolutionary developments in the realm of automobile construction.

When he asked the question about the "car of the future" in 1977, the minister still wanted to know from the industry's development engineers and the German universities what such pioneering innovations would look like. To "ensure a technological lead in one of Germany's key industries," the ministry commissioned prototypes that demonstrate novel automobile technology in an integrated way: energy and raw material saving, antipollution features, safety as well as economy and utility. The automobiles envisioned should offer at least 4 seats, allow more than 400 kg carrying capacity, measure up to today's standards of comfort and average performance. Additionally, all environmental laws in the EEC and the most important export markets are to be taken into account.

In the conceptual phase all the German automobile manufacturers and a team from 4 technical universities participated. The two subsidiaries of American companies on German soil, the Adam Opel Co and Ford Motor Company, were never involved from the beginning. Towards the end of the conceptual phase Porsche and BMW bowed out of the project. The reasons given were that they had too many of their own projects to work on so that there was no unoccupied manpower available for the phase of vehicle development and building prototypes. The only ones left among the researchers on the car

of the future are the Daimler-Benz Co, which is proposing a turbine-powered sedan, the Volkswagen combine with a project in the lower-middle range, and the university team with its Unicar, a middle-range car. What is noticeable about the cars shown so far is that the laws of physics have enforced a great visual similarity. All the automobiles will record substantially lower wind resistance whose coefficient (C_d) is said to be under 0.3--today's cars range between 0.4 and 0.45, although some new models in the last few months could be lowered to as little as 0.36 by attention to the bodywork for this purpose.

By utilizing plastics and aluminum it should be possible to make the experimental cars considerably lighter without sacrificing safety. The VW experimental car will have an empty weight of 640 kg, with internal space that is at least equivalent to today's Rabbit. The latter weighs about 820 kg empty. The lighter weights as well as decreased wind resistance will allow a smaller and more economical engine. VW is building a Diesel engine with only 3 cylinders, but with an efficiency-increasing turbocharger. With a motor like this VW engineers want to decrease the DIN consumption of their experimental car to an average of 5.5 liter/100km, according to the VDA formula. By comparison the current Rabbit Diesel uses at least 1 liter more.

Since consumption figures are heavily dependent on traffic flow and the possibility of driving smoothly, Mercedes engineers are incorporating into their experimental car a "driver management system" which is intended to relieve the driver of the job of monitoring his car and to assist him in selecting the best route. The computer suggests the most fuel-efficient route from an electronically stored road atlas and traffic condition reports.

The scientists from the vehicle institutes of the universities in Darmstadt --the administrative center--Aachen, Berlin and Stuttgart want to attack the problem in a considerably more unconventional way. They see themselves in only limited competition with the efforts of the industry, even if they too "have to struggle with the same problems of physics and material," as press spokesman Bertold Rehm from the Darmstadt Technical University descibes the situation. In many respects they can operate more freely than the industry because marketing interests are of subordinate importance.

The result was a Unicar with a long, flat hood and the shape of a station wagon, but with a rear end section that tapers for good aerodynamics. Special attention was paid to pedestrian protection. Since 85 percent of all pedestrian accidents take place at speeds below 45 km/hour, the low front end and the entire hood were covered with resilient, energy-absorbing plastic. The windshield wipers and their dangerous shafts disappear under the hood. Even the windshield and its surround and pillars were constructed not only from the point of view of good air penetration but also from the viewpoint of pedestrian protection.

The initial results from the windtunnel, in which a Unicar model is being tested, are already available. According to these result a final C_d factor of less than 0.3 can be realized, although the vehicle is already being tested with two aerodynamically integrated outside mirrors. The underside of the car, which has always been neglected and treated as an afterthought, was included by the Unicar planners in their aerodynamic work. It is smooth and uninterrupted for the most part and exposes only the tires and the lowermost parts of the suspension to the slipstream. This construction requires new ways of conducting exhaust gases to the rear of the car. The exhaust pipe in the Unicar runs in a sound- and heat-insulated central tunnel under the floor on the passenger's side and ends conventionally under the rear of the car. The engine compartment is closed off at the bottom and is sound-proofed.

Energy saving in the research vehicle Unicar

Key:

1. Diesel engine
   - Direct injection
   - Turbocharger
2. Aerodynamics
   (C_d 0.29) - small cross section
3. Improved rolling resistance of the tires
4. Electronic control of the infinitely variable transmission
5. Weight saving--no spare tire

[Best reproduction available]

The Unicar will have a conventional engine: a Diesel engine with 4 cylinders, 2.5 liters capacity and turbocharging. The Augsburg-Nuernberg Machine Plant (MAN) is currently building this engine to the Unicar group's specifications. It will have MAN's M-process direct fuel injection. The Compres process, patented by Brown, Boveri and Co (BBC) is planned as an alternative means of supercharging the engine. The universities wanted to offer the 8-cylinder axial piston engine developed by the Technical University of Aachen as an alternative engine, but the Bonn Ministry of Research did not continue funding, since the program was restricted to conventional piston engine technology, which is acknowledged as being more certain for the future. The transmission will be an infinitely variable unit developed by the Dutch firm van Doorne under the name Transmatic. In contrast to the currently marketed version the transmission in the Unicar is not designed for hydraulic but for a new electronic control system that is still to be developed. It should be possible with an automatic transmission to run the motor within a fuel-efficient range without having to accept fuel consumption in exchange. Since there is already an in-car computer for the transmission, one or several such little boxes in the Unicar will assist the driver in operating, checking and driving his vehicle.

Rehm's response to questions about the marketability of such cars is calm: "Marketing is not our primary problem, but naturally we see our car through the eyes of car buyers, which we are as well."

To judge by the current state of affairs the Unicar will weigh in at a healthy empty weight of 1,250 kg, and according to initial calculations will achieve an average consumption of 6.7 liters/100 km with its turbocharged diesel engine. In September 1981 the driver testing phase begins, as it does for all the other prototypes.

It will end in 1982 with the crash test of one of the six Unicars to be built. Since DM 35 million have been requested for the entire project, the value of one prototype can be estimated at close to DM 6 million, which will smash into a concrete wall.

The World Federation of Automobile Engineers FISITA has meanwhile calculated exactly that a substantial potential for saving gasoline and diesel fuel from oil can be found in substituting alternative energy sources and power units. But even ethanol from biomass is not available in unlimited quantities. The principal restrictions are limited means of cultivation, for food production and biomass production are in competition.

In the future synthesized fuels on a coal base are expected to make a worthwhile contribution, for example methanol. According to FISITA's calculations a synthesizing power plant in the FRG with an annual output of 2 to 3 million tons of fuel could be completed at the earliest in 6 years, by the year 2000 4 plants with an output of 12 million tons of fuel. Using current figures FISITA puts the cost of a 100 km trip using diesel fuel at DM 6.8 (615 liters), on gasoline at DM 8.8 (8.5 liters), methanol DM 10.20

(15.5 liters, distilled from 70 kg lignite) and for ethanol about DM 21 (11.61 liters, fermented from 160 kg sugar cane).

FISITA sees additional possiblities for saving in the use of gas and electric vehicles in city and local transportation as well as vehicles with hybrid propulsion. With an optimal use of all possibilities automobile engineers assume that oil requirements for transportation in the year 2000--even with increasing numbers of vehicles--in the FRG will amount to only half of current use. Helmuth Buddenberg, chairman of the board of BP Germany, has a different view: "Oil requirements in the FRG will be just as high in 20 years as they are today. One must distinguish between where effective substitutes can be found for oil--in the heating and electrical generating sector--and where they cannot--for example in the petrochemical and transportation sector." The increasingly urgent question for him is a total energy concept with clear data. "The framework must be right in order to awaken and channel a readiness to invest among industry and consumers. So far we haven't just wasted energy, but above all time."

9581
CSO: 3102

AUTO INDUSTRY WORKS ON FUEL-SAVING ENGINES

Hamburg DER SPIEGEL in German 14 Jul 80 p 161

[Text] In the experimental departments of the automobile compenies fuel-saving engines are improving, but the engineers have not mastered the decisive problem.

For 8 years engineers of the Bavarian Motor Works worked on the engine. When it was ready for production in 1978 an executive decision sent it to the museum.

The PR writers of BMW compared the premature demise of their 12-cylinder enginer, shrouded in secrecy, with a primeval drama, "as once before changing environmental conditions led to the disappearance of the dinosaurs." Rising oil prices and enforced economy measures would not have allowed the engine adequate living space.

The turn in trends was clear: the striving for ever larger, more powerful and thirstier engines was dying out, the omnipotence of the stylists was broken. A director of Ford: "Then the hour of the engin-ers returned." "Whatever is beautiful, is right"--for decades the artistic eye of the designed had decided the success of an automobile according to this rule of thumb. Now the aerodynamicist and the engine builder were coming to prominence: lighter, less wind-resistant cars with "economy engines" had to be developed.

Oddly enough: while BMW's managers were sacrificing their 12-cylinder beauty, Mercedes-Benz technicians were standing unshakeably by their 8-cylinder engines developed about the same time and with uncontemporary sounding capacities of 3.8 and 5.0 liters. Prof Werner Breitschwerdt, head of development at Mercedes, believes: "That is the ideal size for our cylinder cutout."

In this refined version of the fuel-saving engine, which Daimler-Benz plans to offer in barely 2 years, 2 or even 4 cylinders are switched off to conserve fuel whenever the driver does not need them, for example, in heavy stop-and-go traffic. It would be like having three engines in one

for the driver of a car equipped like this. "You don't have to give up the enjoyment of a fine engine," says Breitschwerdt in praise of the idea, which Audi-NSU chief engineer Ferdinand Piech holds in low regard and on which other firms, such as BMW and Porsche, are working intensively. Almost all auto companies are trying to develop fuel-saving engines using the most advanced technology, which simultaneously offer high performance and long engine life in spite of small capacity and low consumption. However, on the average it takes 5 years for new engines to be ready for production.

Engineers have already succeeded in tangibly curbing the gas consumption of conventional engines by the use of countless electronic aids and complicated devices like the exhaust turbocharger. The goal is the same for the time being in all countries: constructors are being guided by the U.S. Government-mandated fleet fuel consumption for the U.S. market, the average consumption of all the models of a manufacturer. Presently all the automobile managers are shaking at the fuel consumption required for 1986: 8.6 liters/100 kilometers.

In the new Ford Escort, which will come onto the market in the fall, flashing lights will remind the driver to accelerate gradually and more carefully. In the new VW Passat, which is expected at the same time, signal lights ask the driver to shift into a more economical gear. In spite of all the refinements like combustion chambers with squish edges, pistons with cooling passages and other consumption lowering measures: a genuine fuel-saving engine can only be that powerplant that was developed specifically for the most economical driving and that develops its economical character without the driver's aid.

The engine of the Ford Escort, expected soon, is considered to be one of the first engines of this new economy generation. The concern has spent the record sum of DM 2 billion for this 4-cylinder engine, which is to be built at the rate of 1 million units annually. On account of its specially angeled valve positions the engine is called a CVH engine (for Compound Valve Angle Hemispherical Chamber). The combustion chamber is ideally shaped according to the current state of technology and permits 15 percent more power, 16 percent less fuel and 17 percent more torque compared with equivalent conventional engines.

The engineers have not yet solved the trickiest problem on the way to the highly economical piston engine, although all the famous automobile manufacturers are working on it intensively. Their efforts are directed at the so-called stratified charge process which is supposed to effect guaranteed ignition of mixtures variously charged with fuel, but all extremely "lean." The mixture is in effect layered: a "fat" central charge surrounding the spark plug is supposed to ignite the fuel-lean remainder.

In the United States Ford has already announced the last stage in the development of such a "propulsion system with preprogramed combustion" called the Proco engine. The computer-controlled lean-burn engine is said to use 20 percent less fuel without loss of performance and meet the strict exhaust requirements of the 1980s without performance-robbing, expensive detroxification devices. The problem: fat and lean mixtures cannot be separated reliably at the moment.

The cautious men of the Daimler-Benz Co are keeping several other options open in view of such uncertain prospects. They even want to offer an engine of only 1.6 liters capacity in the "small" Mercedes that is being developed.

The people in Stuttgart envisage something much more refined for future transportation "during the next decade," which will also be tested in the experimental automobile financed with government funds: a 110 Kw gas turbine that uses only 8.3 to 10.1 liters/100 kilometers.

9581
CSO: 3102

END

END OF FICHE DATE FILMED

12 SEPT 80

DTIC